



The European Organisation for Civil Aviation Equipment
L'Organisation Européenne pour l'Équipement de l'Aviation Civile

INTEROPERABILITY STANDARDS FOR VOIP ATM COMPONENTS

ADDENDUM 6 TO VOLUME 2: EXTENDED CALL FORWARD

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ED-137/2C-6

March 2019

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FOREWORD

1. This document forms Addendum 6 “Interoperability Standards for VoIP ATM Components – Volume 2 Addendum 6: Extended Call Forward” to ED-137C Volume 2: Telephone [5], and was prepared by EUROCAE Working Group 67 and was accepted by the Council of EUROCAE on 23 March 2019.
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3. The findings of EUROCAE are resolved after discussion among its members and, where appropriate, in collaboration with RTCA Inc, Washington D.C. USA and/or the Society of Automotive Engineers (SAE), Warrendale, PA, USA through their appropriate committee.
4. This version of the document represents “the minimum European specification required for Manufacturers and Users to assure Interoperability from/to VoIP ATM Telephone Components to/from Legacy systems”.
5. This version is taking into account the EUROCONTROL VoIP in ATM Test Case Specification.
6. EUROCAE performance specifications are recommendations only. EUROCAE is not an official body of the European governments; its recommendations are valid statements of official policy only when adopted by a particular government or conference of governments.
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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Ground-Ground (G-G) ATM voice systems have been based upon analogue and more recently, digital Time Division Multiplexing / Pulsed Code Modulation (TDM/PCM) technologies for many years.

Nowadays, however, convergence of voice and data into one multimedia network is a popular trend with a variety of technical solutions available on the market. Following in this direction ATM communication networks are adopting, by a process of gradual evolution, a common infrastructure for voice and data services.

As the technology has developed IP Technology has now the true potential to fulfil operational and technical ATM communication requirements - including those of voice / data convergence, Quality of Services (QoS), security and safety. There is also the possibility that IP may deliver solutions that will, over time, bring about true savings in investment and operating costs.

EUROCAE Working Group 67 (WG-67) undertook the mission to assess the feasibility of using Voice over Internet Protocol (VoIP) for providing ATM voice services. The group defined criteria, requirements and guidelines based upon the following operational needs and constraints:

- Operational and Technical Air-Ground (A-G) and Ground-Ground (G-G) ATM Voice system requirements;
- Existing IP Voice protocols and signalling standards;
- IP network capabilities for Voice services;
- Security, Quality of Service (QoS), and Convergence (infrastructure, protocol, applications);
- Existing IP Voice ATM system capabilities and service interfaces.

The following tasks were identified to fulfil the WG-67 mission:

- Define ATM Systems and identify their components (Voice Communication System / VCS, Ground-based Radio Station / GRS)
- Determine possible additional operational and technical ATM requirements for new ATM voice systems, also taking into consideration A-G communications.
- Make recommendations to upgrade current standardisation documents.
- Develop a Technical Specification for a VoIP Voice ATM System including:
 - Minimum performance and safety/security requirements for the system and, if appropriate, for components;
 - Interoperability requirements between IP components of the VoIP ATM system;
 - Minimum performance requirements of an IP Network to support ATM Voice services;

Consequently, the following three documents were delivered:

ED-136 - VoIP ATM System Operational and Technical Requirements

ED-137 - Interoperability Standards for VoIP ATM Components

ED-138 - Network Requirements and Performances for VoIP ATM Systems

The contents of all three documents are premised on the “**Vienna Agreement**” which defines the different components of a VoIP ATM system and their mutual interfaces as depicted in FIGURE 1.1.

VIENNA AGREEMENT

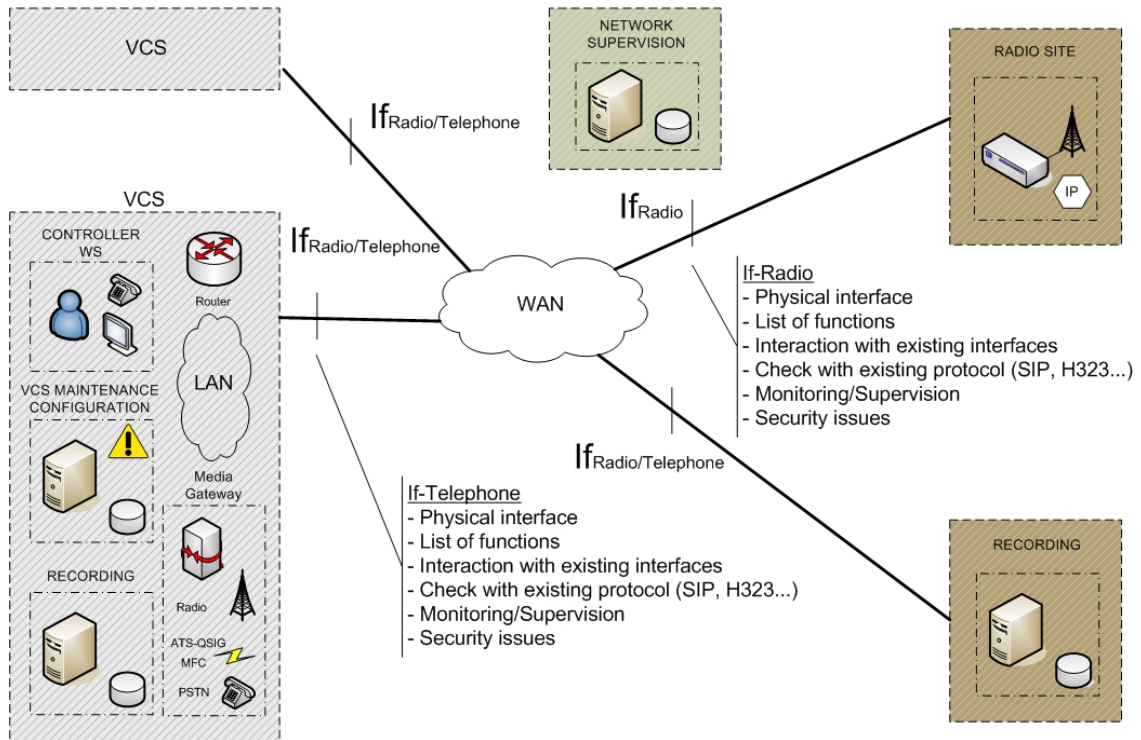


FIGURE 1.1: VIENNA AGREEMENT

VoIP components are interconnected through an IP network and suppliers are free to define their internal architecture (IP/Ethernet, TDM/PCM - Time Division Multiplexing/Pulsed Code Modulation, etc.) Between VoIP components, required interfaces are defined to guarantee their functional and technical interoperability.

Therefore, VoIP ATM Systems are composed of:

- **VoIP VCS Components** performing Radio and / or Telephone functions, including:
 1. Controller Working Positions, assuring HMI including voice devices (microphone and loudspeaker);
 2. Possible local VCS Maintenance and Configuration stations;
 3. Possible local Recording devices;
 4. Possible LAN for local interconnection;
 5. Possible Media Gateways to legacy systems (ATS-QSIG, ATS-R2, ATS-No.5, PSTN, Radio analogue lines, etc.)
- **VoIP Ground Radio Station Components** performing DSB-AM VHF and UHF Radio functions.
- **VoIP Supervision System Components** performing monitoring and control functions.
- **VoIP Recording Components** performing recording functions.
- **IP WAN Components** performing interconnection services between two or more different

1.2 ED-137 VOLUME 2 ADDENDUM 6 PRESENTATION

The scope of the WG-67 ED-137 Documents is to define the rules for VoIP implementations to support ATM communications:

- Radio for the Volume 1
- Telephone for the Volume 2
- Recording for the Volume 4
- Supervision for the Volume 5

This includes the performances requested for the related communications.

The present document, ED-137C Volume 2 Addendum 6, proposes a profile standard for a Call Forward Solution that replaces the Basic Call Forward subsection of ED-137C Volume 2 [5]. This Extended Call Forward solution will establish call forward negotiation and establishment for an advanced solution that is intended to provide more configurable capabilities to a Call Forward Endpoint in an Air Traffic Services Ground Voice Network (AGVN).

1.3 TERMINOLOGY FOR REQUIREMENTS, RECOMMENDATIONS AND OPTIONS

The terminology for requirements, recommendations and options in this document is based on RFC 2119 [3], which specifies Best Current Practice regarding the use of Key Words for the Internet Community. As such, the following terminology is applied:

- The word **SHALL** denotes a mandatory requirement;
- The word **SHOULD** denotes a recommendation;
- The word **MAY** denotes an option.

To avoid confusion with their natural meanings in the English language, the words **SHALL**, **SHOULD**, and **MAY** take on the meaning stated above only where printed in boldface. When printed in normal (Arial) typeface, the natural English meaning is meant.

Detailed description of terminology:

1. **SHALL**: This word has the same meaning as the phrase "REQUIRED" and means that the definition is an absolute requirement of the specification.
2. **SHALL NOT**: This phrase means that the definition is an absolute prohibition of the specification.
3. **SHOULD**: This word, or the adjective "RECOMMENDED", means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
4. **SHOULD NOT**: This phrase, or the phrase "NOT RECOMMENDED" mean that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behaviour described with this label.
5. **MAY**: This word, or the adjective, "OPTIONAL", means that an item is truly optional.

1.4 VERSION TRACKING

The present document, ED-137/2C ADD06, **SHALL** be referenced as **phone.add06.02** in the WG67-Version SIP header field described in ED-137 Volume 2 [5].

CHAPTER 2

COMMUNICATION MODEL

2.1

DEFINITIONS

The following terms are used in this document:

- **Call Forward OPTIONS Messaging** – SIP OPTIONS messages will be sent in order to setup, manipulate, and breakdown active Call Forwards. The Call Forward algorithm is identified by the namespace and encoding as specified in the Accept and Content-Type headers of “application/wg67.cfwd.extended.cmd+xml”. OPTIONS messages will include an XML message body in order to carry ID Lists and a unique <action> element in the XML message body, as required. The varying types of messages are as follows:
 - **Audit OPTIONS Message** – An OPTIONS message will be utilized to audit ID Lists maintained within a Call Forward Chain on a periodic basis. The Audit OPTIONS message can be sent in either the upstream or downstream directions and will contain an XML message body with the appropriate <action> element and applicable ID Lists.
 - **Complete OPTIONS Message** – An OPTIONS message will be utilized to indicate a Call Forward request was successfully established. Additionally, the Complete OPTIONS message will be utilized in response to a Release Failure, to indicate the Call Forward remains active. The Complete OPTIONS message will only be sent in the upstream direction and will contain an XML message body with the appropriate <action> element but will not contain ID Lists.
 - **Idle OPTIONS Message** – An OPTIONS message will be utilized to indicate a Call Forward Release was successfully processed and the Call Forward is now idle. Additionally, the Idle OPTIONS message will be utilized to indicate a Call Forward Request was unable to be established. The Idle OPTIONS message will be sent in the upstream direction and will contain an XML message body with the appropriate <action> element but will not contain ID Lists.
 - **Release OPTIONS Message** – An OPTIONS message will be utilized to request an active Call Forward be broken down. The Release OPTIONS message will be sent in the downstream direction and will contain an XML message body with the appropriate <action> element but will not contain ID Lists.
 - **Remote Release OPTIONS Message** – An OPTIONS message will be utilized to request an active Call Forward initiated by a different user agent be broken down. The Remote Release OPTIONS can be sent to any user agent and will contain an XML message body with the appropriate <action> element but will not contain ID Lists.
 - **Request OPTIONS Message** – An OPTIONS message will be utilized to request a new Call Forward be established. The Request OPTIONS message will be sent in the downstream direction and will contain an XML message body with the appropriate <action> element and applicable ID Lists.
 - **Update OPTIONS Message** – An OPTIONS message will be utilized to pass updates of ID Lists maintained within a Call Forward Chain. The Update OPTIONS message can be sent in either the downstream or upstream directions and will contain an XML message body with the appropriate <action> element and applicable ID Lists.
- **Call Forward Chain** - A series of user agents each enabling call forward to form an inline connection where all calls to any user agent in the chain would be forwarded to the tail node.

- **Downstream:** The direction from the Forwarding party towards the Forwarded-To party.
- **Endpoint** (a.k.a. Tail Node) – A user agent receiving forwarded calls and does not have call forward setup to forward its calls.
- **Forward Loop Closure** – When a Call Forward Chain has no endpoint due to a user agent in the chain forwarding its calls to a user agent upstream in the same Call Forward chain.
- **Head Node** – A user agent forwarding its calls and does not receive forwarded calls from any other user agents.
- **Identifier Lists** – A string of URIs that will be encoded and distributed in XML message bodies, along Call Forward paths in order to pass information required in the establishment of specific functions and features of Call Forward.
 - **Downstream Only ID List** – A generic format for identifier lists that are utilized to have a Call Forward Endpoint adapt its configuration to meet system requirements. Therefore, lists that use this generic format will only be sent in the downstream direction and be given a descriptive, unique name.
 - **Forward Identifier (FID) List** – An identifier list that consists of unique identifiers corresponding to user agents that are active in a Call Forward chain. The FID List is intended to prevent and allow mitigation of detrimental effects surrounding Call Forward Loop Closure, hence it will be sent in the upstream and downstream directions.
- **Pre-Connected Call** – A call that requires a dialog established at all times to allow for call alerting.
- **Upstream:** The direction from the Forwarded-To party towards the Forwarding party.